IN THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

1. (Currently Amended) A method of scanning for writing a pattern on a surface, comprising:

providing a scanning beam comprised of a plurality of independently addressable sub-beams;

scanning the surface with said scanning beam a plurality of times, said sub-beams scanning the surface side-by side in the cross-scan direction, each said sub-beam being modulated to reflect information to be written; and

overlapping the beams in successive scans in the cross scan direction such that all written areas of the surface are written on during at least two scans.

2. (Original) A method according to claim 1 wherein said written areas are written on at least three times.

3. (Original) A method according to claim 1 wherein said written areas are written on at least four times.

4. (Original) A method according to claim 1 wherein said written areas are written on at least six times.

5. (Original) A method according to claim 1 wherein said written areas are written on at least eight times.

6. (Original) A method according to claim 1 wherein said written areas are written on at least twelve times.

7. (Original) A method according to claim 1 wherein said written areas are written on at least twenty four times.

8. (Previously Presented) A method according to claim 1 wherein the beam is formed by separately modulating individual segments of an oblong beam, said segments comprising said sub-beams.

9. (Original) A method according to claim 8 wherein separately modulating comprises:

providing an oblong beam having a usable extent in the long direction; and

providing a plurality of modulation segments along said long direction, the total extent of said segments being greater than the usable extent.

10. (Previously Presented) A method according to claim 1 wherein the sub-beams are separately produced and including combining the sub-beams to form said beam.

11. (Previously presented) A method according to claim 1 wherein the unmodulated energy of at least two of the separately addressable sub-beams is different.

12. (Original) A method according to claim 11 wherein the unmodulated energy has a generally Gaussian profile.

13. (Previously Presented) A method according to claim 11 wherein the modulation of the beam is binary, on-off modulation.

14. (Previously Presented) A method according to claim 1 wherein a pattern having a minimum feature size is written and wherein the spacing of the sub-beams is substantially smaller than the feature size.

15. (Original) A method according to claim 14 wherein the minimum feature size is at least four times as large as the extent of the sub-beams.

16. (Previously Presented) A method according to claim 14 wherein the minimum feature size is less than or equal to about 77 micrometers.

17. (Previously Presented) A method according to claim 14 wherein the minimum feature size is less than or equal to about 51 micrometers.

18. (Previously Presented) A method according to claim 14 wherein the minimum feature size is less than or equal to about 39 micrometers.

19. (Previously Presented) A method according to claim 1 wherein the sub-beams are spaced by a predetermined distance at said surface and wherein the sub-beams have an extent at the surface in the direction of adjacent beams and wherein the extent is greater than the spacing.

20. (Original) A method according to claim 19 wherein the spacing is less than about 15 micrometers.

21. (Original) A method according to claim 19 wherein the spacing is less than about 10 micrometers.

22. (Original) A method according to claim 19 wherein the spacing is about 6.35 micrometers.

23. (Original) A method according to claim 19 wherein the spacing is less than about 6.35 micrometers.

24. (Previously Presented) A method according to claim 19, wherein the extent is at least twice the spacing.

25. (Original) A method according to claim 24 wherein the extent is at least three times the spacing.

26. (Previously Presented) A method according to claim 19 wherein the extent is more than about 6.35 micrometers.

27. (Previously Presented) A method according to claim 19 wherein the extent is greater than or equal to about 12.7 micrometers.

28. (Previously Presented) A method according to claim 19 wherein the extent is greater than or equal to about 19 micrometers.

29. (Previously Presented) A method according to claim 19 wherein the extent is greater than or equal to about 25.4 micrometers.

30. (Currently Amended) A method of optimizing throughput in a scanning system while selectively delivering a variable desired level of energy to [[the]]a surface, comprising:

scanning [[a]]the surface in accordance with claim 1 to provide exposed areas and unexposed areas in accordance with modulation of the sub-beams;

providing said beam at a given optimized power;

determining a combination of parameters including (1) beam scanning velocity between a maximum and minimum velocity, said maximum and minimum velocities defining a scanning velocity ratio; (2) a speed of relative movement of the surface and the beams in a direction normal to the scan; and (3) a beam overlap suitable for exposing the exposed surface areas to the desired energy with the beam at optimized power; and

exposing the surface utilizing the determined combination of parameters.

31. (Currently Amended) A method according to claim 30 and including:

selectively varying the energy delivered to exposed areas on the ~~board~~ surface by a ratio substantially greater than the scanning velocity ratio, by varying the parameters.

32. (Currently Amended) A method of optimizing throughput in a scanning system while selectively delivering a variable desired level of energy to [[the]]a surface, comprising

providing a beam at a given optimized power;

modulating the beam;

scanning the beam across the surface in a first direction with a first velocity, between a maximum and minimum velocity, said maximum and minimum velocities defining a scanning velocity ratio;

relatively moving the surface and the scanning beam on a second direction normal to the first direction at a second velocity; and

selectively varying the energy delivered to exposed areas on the ~~board~~ surface by a ratio substantially greater than the scanning velocity ratio.

33. (Currently Amended) A method according to claim 32 wherein the energy delivered is varied by a factor at least one and [[on]]one-half times as high as the scanning velocity ratio.

34. (Original) A method according to claim 33 wherein the energy delivered is varied by a ratio at least three times as high as the scanning velocity ratio.

35. (Original) A method according to claim 33 wherein the energy delivered is varied by a ratio at least five times as high as the scanning velocity ratio.

36. (Original) A method according to claim 33 wherein the energy delivered is varied by a ratio at least ten times as high as the scanning velocity ratio.

37. (Previously Presented) A method according to claim 32 wherein the scanning velocity ratio is no greater than 1.5.

38. (Previously Presented) A method according to claim 32 wherein the scanning velocity ratio is no greater than 2.

39. – 80. (Cancelled)

81. (Currently Amended) Apparatus ~~according to claim 80 wherein the clock generator includes:~~ for scanning a beam across a surface, comprising:

a first beam;

a modulator operative to receive said first beam at an optical input thereof, and to modulate said first beam produces a modulated light beam at an exit thereof, based on a modulation signal thereto;

a second beam;

a scanner operative to the first and second beams and scans the first beam across the surface and the second beam along a path substantially parallel to the path of the first beam;

a controller operative to provide said modulation signal responsive to the position of the second beam;

a marked scale upon which the second beam is configured to impinge, such that the second beam is reflected therefrom to form a modulated reflected beam, the second beam being configured to impinge on the scale at an angle to its surface, such that the modulated reflected beam is reflected along an axis, different from that of the second beam;

a detector operative to receive said modulated reflected beam and to generate a modulated signal therefrom, said controller being operative to provide said modulation, based on a timing of said modulated signal;

a clock generator operative to receive the modulated signal and to generate a timing clock having a clock frequency that is controllably related to the frequency of the modulated signal;

a first generator ~~that generates~~ being operative to generate an intermediate clock and an inverse intermediate clock having the same frequency and inverse phases; and

switching circuitry having two inputs [[that]]being operative to receive the intermediate clock and the inverse intermediate clock respectively and a timing clock output to which the clock at one of the two inputs is selectively switched, such that the average frequency of the timing clock at the output is controlled by said selective switching.

82. (Original) Apparatus according to claim 81 wherein the switching circuitry switches said inputs to said output responsive to clock correction information.

83. (Currently Amended) Apparatus according to claim [[80]]81, and including:

a data store containing stored modulation information, which passes said information to said modulator for modulating the first beam, based on timing of said ~~stable~~ timing clock.

84. – 88. (Cancelled)

89. (Withdrawn) Apparatus for holding flat plates of varying sizes, comprising:

a base section having a flat surface and including a plurality of interconnected channel formed on the surface thereof;

at least one port connecting to said channels;

a vacuum source connected to the at least one port;

an intermediate plate covering all of said channels and having a multiplicity of holes formed therethrough, that are present only in areas of the flat surface without holes.

90. (Withdrawn) Apparatus according to claim 89 wherein at least a portion of the base section comprises an array of truncated pyramids, flat tops of said pyramids comprising the flat surface an areas between the pyramids comprising the channels.

91. (Withdrawn) Apparatus according to claim 89 wherein the density of said holes is sufficient to hold said plate flat against said flat surface.

92. (Currently Amended) Scanning apparatus, for writing a pattern on a surface, comprising:

a beam, modulated by data;

a rotating polygon, comprising a plurality of facets that move as the polygon rotates;

a first optical system ~~that focuses~~ operative to focus the beam at least in a cross-scan direction, on a facet, such that the beam is angularly scanned in a scan direction, as the polygon rotates;

a second optical system ~~that receives~~ operative to receive the beam and ~~focuses~~ focus it on the surface, said second optical system configured to introduce a systematic deviation in the cross-scan location of the beam as a function of a position of the beam in the scan direction such that wobble of the polygon does not ~~transfer as cross scan deviations to the surface~~appreciably move the beam in the cross scan direction relative to a systematically deviated location.

93. (Currently Amended) Scanning ~~optics~~ apparatus according to claim 92 wherein the beam is defocused in the scan direction on the polygon.

94. (Currently Amended) Scanning ~~optics~~ apparatus according to claim 92 wherein the beam is focused in both scan and cross-scan directions on the surface.

95. (Currently Amended) Scanning apparatus according to claim 92 wherein the second optical system transforms the angular sweep of the beam into a ~~lineal~~ linear sweep on the surface.

96. (Currently Amended) Scanning apparatus according to claim 92 wherein ~~the second optical system introduces systematic deviations in the cross-scan direction as a function of its position in the scan direction; and~~ a data source ~~that changes~~ is operative to change the data modulating the beam to compensate for the ~~crossscan deviations~~systematic deviation in the crossscan direction.

97. (Currently Amended) Scanning apparatus for writing a pattern on a surface in a series of passes, comprising:

at least one beam, modulated by at least one data signal;

a rotating polygon, comprising a plurality of facets that move as the polygon rotates;

an optical system that receives the at least one beam and focuses it on the surface, such that a pattern is written on the surface by the at least one beam, wherein the optical system introduces systematic deviations in the cross-scan ~~direction~~ location of the beam as a function of its position in the scan direction; and

a data source that changes the data modulating the beam to compensate for the systematic crossscan deviations.

98. (Previously Presented) Apparatus according to claim 97 and including:

a multi-channel optical modulator that receives at least one beam, and modulates the at least one beam to form the modulated beam.

99. (Currently Amended) Apparatus according to claim 98 and including a data store which stores a plurality of lines of data, said plurality of lines being greater than the number of independently modulated channels of the modulator and wherein data is sent to the modulator to modulate the beam from a line in response to the systematic cross-scan deviation.

100. (Currently Amended) Apparatus according to claim 99 wherein the data store also stores the dependence of the systematic cross-scan deviation with scan position.

101. (Previously Presented) Apparatus according to claim 99 wherein the at least one beam comprises a plurality of beams.

102. (Original) Apparatus for writing a pattern on a radiation sensitive surface, comprising:

at least one laser beam having a predetermined intensity;

a modulator that receives the at least one beam at an input thereof and produces at least one modulated beam at an output thereof, and

a scanner that scans the at least one modulated beam across the surface with a scanning velocity within a scan velocity range in a plurality of successive, partially overlapping swaths having a variable overlap within a range of overlaps,

wherein the overlap and the scanning velocity are separately controllable, such that a range of power levels greater than that possible with either the range of overlaps or than the range of velocities may be delivered to the surface.

103. (Cancelled)

104. (Original) Scanning apparatus, for writing a pattern on a surface, comprising:

a beam comprising energy at two distinct spectral lines, modulated by data; and

an optical system that receives the beam and focuses it on the surface, such that a pattern is written on the surface by the at least one beam and such that the energy at both spectral lines is focused on the surface at the same position.

105. – 110. (Cancelled)

111. (New) A method of scanning for writing a pattern on a surface, comprising:

providing a scanning beam comprised of a plurality of independently addressable sub-beams, wherein said beam is formed by separately modulating individual segments of an oblong beam, said segments comprising said sub-beams;

scanning the surface with said scanning beam a plurality of times, said sub-beams scanning the surface side-by side in the cross-scan direction, each said sub-beam being modulated to reflect information to be written; and

overlapping the beams such that all written areas of the surface are written on during at least two scans.

112. (New) A method of scanning for writing a pattern on a surface, comprising:

providing a scanning beam comprised of a plurality of independently addressable sub-beams, wherein the unmodulated energy of at least two of the separately addressable sub-beams is different;

scanning the surface with said scanning beam a plurality of times, said sub-beams scanning the surface side-by side in the cross-scan direction, each said sub-beam being modulated to reflect information to be written; and

overlapping the beams such that all written areas of the surface are written on during at least two scans.

113. (New) A method of scanning for writing a pattern on a surface, comprising:

providing a scanning beam comprised of a plurality of independently addressable sub-beams;

scanning the surface with said scanning beam a plurality of times, said sub-beams scanning the surface side-by side in the cross-scan direction, each said sub-beam being modulated to reflect information to be written;

overlapping the beams such that all written areas of the surface are written on during at least two scans, wherein:

a pattern having a minimum feature size is written and wherein the spacing of the sub-beams is substantially smaller than the feature size.

114. (New) A method of scanning for writing a pattern on a surface, comprising:

providing a scanning beam comprised of a plurality of independently addressable sub-beams, said sub-beams being spaced by a predetermined distance at said surface and wherein the sub-beams have an extent at the surface in the direction of adjacent beams and wherein the extent is greater than the spacing.

scanning the surface with said scanning beam a plurality of times, said sub-beams scanning the surface side-by side in the cross-scan direction, each said sub-beam being modulated to reflect information to be written; and

overlapping the beams such that all written areas of the surface are written on during at least two scans.

115. (New) A method of optimizing throughput in a scanning system while selectively delivering a variable desired level of energy to a surface, comprising:

scanning the surface to provide exposed areas and unexposed areas in accordance with a modulation of sub-beams, said scanning including:

providing a scanning beam comprised of a plurality of independently addressable sub-beams;

scanning the surface with said scanning beam a plurality of times, said sub-beams scanning the surface side-by side in the cross-scan direction, each said sub-beam being modulated to reflect information to be written; and

overlapping the beams such that all written areas of the surface are written on during at least two scans

providing said beam at a given optimized power;

determining a combination of parameters including (1) beam scanning velocity between a maximum and minimum velocity, said maximum and minimum velocities defining a scanning velocity ratio; (2) a speed of relative movement of the surface and the beams in a direction normal to the scan; and (3) a beam overlap suitable for exposing the exposed surface areas to the desired energy with the beam at optimized power; and

exposing the surface utilizing the determined combination of parameters.